

WHAT IS CLAIMED IS:

1. A process for making a metal mill product from a refractory metal powder comprising:

- 5 (a) providing a low oxygen refractory metal powder;
(b) adding to the powder a grain growth inhibitor to the low oxygen refractory metal powder before consolidating the powder;
(c) consolidating the powder by either hot isostatic pressing; extrusion or another thermomechanical working process; and
(d) subjecting the consolidated powder to subsequent
10 thermomechanical processing, and thereby forming the mill product.

2. The process of Claim 1, wherein the refractory metal is niobium or a niobium alloy.

3. The process of Claim 1, wherein the refractory metal is selected from the group consisting of hafnium, molybdenum, rhenium,
15 tantalum, tungsten, vanadium, and zirconium metals, alloys of the foregoing metals, and combinations thereof.

4. The process of Claim 1, wherein prior to consolidating the powder, the grain growth inhibitor is added to the powder by (i) blending an inhibitor component with the powder or (ii) a residue of a de-oxidation
20 process.

5. The process of Claim 4, wherein the residue is a residue formed in a de-oxidation process, wherein magnesium is added to capture the oxygen from the niobium powder and magnesium oxide forms during the de-oxidation process.

25 6. The process of Claim 4, wherein the inhibitor component is selected from the group consisting of SiO_2 , Y_2O_3 , and mixtures thereof.

7. The process of Claim 1, wherein the low oxygen niobium powder has an oxygen content that is less than about 400 ppm.

8. The process of Claim 1, wherein the low oxygen niobium
30 powder has an oxygen content that is less than about 300 ppm.

9. The process of Claim 1, wherein the low oxygen niobium powder has an oxygen content that is less than about 200 ppm.

10. The process of Claim 1, wherein the low oxygen niobium powder has an oxygen content ranging from about 100 ppm to about 150 ppm.

5 11. The process of Claim 1, wherein the low oxygen niobium powder has an oxygen content that is less than about 100 ppm.

12. The process of Claim 1, wherein the mill product is a sheet containing oxide particles.

13. The process of Claim 1, wherein the mill product is a foil.

10 14. The process of Claim 1, wherein the mill product is a sheet weighing at least 100 pounds.

15. A mill product comprising a stabilized grain size made from a process comprising:

(a) providing a low oxygen refractory metal powder;

15 (b) adding to the powder, before consolidating the powder, a grain growth inhibitor to the low oxygen refractory metal powder,

(c) consolidating the powder by either hot isostatic pressing, extrusion or another thermomechanical working process; and

(d) subjecting the consolidated powder to subsequent thermomechanical processing, and thereby forming the mill product.

20 16. The process of Claim 15, wherein the refractory metal is niobium or a niobium alloy.

25 17. The mill product of Claim 15, wherein the refractory metal is selected from the group consisting of hafnium, molybdenum, rhenium, tantalum, tungsten, vanadium, and zirconium metals, alloys of the foregoing metals, and combinations thereof.

18. The mill product of Claim 15, wherein prior to consolidating the powder, the grain growth inhibitor is added to the powder by blending an inhibitor component or (ii) a residue of a de-oxidation process.

30 19. The mill product of Claim 15, wherein the residue is a residue formed in a de-oxidation process, wherein magnesium is added to capture the oxygen from the niobium powder and magnesium oxide forms during the de-oxidation process.

20. The mill product of Claim 18, wherein the inhibitor component is selected from the group consisting of SiO_2 , Y_2O_3 , and mixtures thereof.

5 21. The mill product of Claim 15, wherein the low oxygen niobium powder has an oxygen content that is less than about 400 ppm.

22. The mill product of Claim 15, wherein the low oxygen niobium powder has an oxygen content that is less than about 300 ppm.

23. The mill product of Claim 15, wherein the mill product is a sheet or a foil.

10 24. A process for making a metal mill product from a niobium powder comprising:

(a) providing a low oxygen niobium powder having an oxygen content that is less than about 400 ppm;

15 (b) adding to the powder a grain growth inhibitor to the low oxygen niobium powder before consolidating the powder by blending an inhibitor component or (ii) a residue of a de-oxidation process, wherein the residue is a residue formed in a de-oxidation process, wherein magnesium is added to capture the oxygen from the niobium powder and magnesium oxide forms during the de-oxidation process,

20 (c) consolidating the powder by either hot isostatic pressing, extrusion or another thermomechanical working process; and

(d) subjecting the consolidated powder to subsequent thermomechanical processing, and thereby forming the mill product.

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